CLAIMS

What is claimed is:

1. An electronic circuit configured to be electronically connectable to an electrochemical cell for receiving a biological sample and having a capacitance created by said biological sample when a voltage is applied to said electrochemical cell, said circuit comprising:

an oscillation circuit configured to receive a voltage input signal resulting from the charging and discharging of the electrochemical cell and configured to convert said voltage input signal to an oscillating voltage output signal proportional to the capacitance of the cell.

2. The electronic circuit of claim 1 wherein said oscillation circuit is a Schmidt trigger circuit.

3. The electronic circuit of claim 1 further comprising a microprocessor operatively and electronically coupled to said oscillation circuit.

4. The electronic circuit of claim 3 wherein said microprocessor comprises means for deriving the value of the volume of said sample.

5. The electronic circuit of claim 4 wherein said microprocessor comprises means for determining the adequacy of said volume for measurement of one or more analytes within the sample.

6. The electronic circuit of claim 5 wherein said microprocessor comprises means for compensating for an inadequate volume of sample in order to proceed with the analyte measurement.

7. The electronic circuit of claim 1 further comprising a supply voltage in the range from about 1.8 to 5.0 V, and wherein said oscillation circuit comprises an operational amplifier having an upper voltage in the range from about 200 to 600 mV and an lower voltage in the range from about 0 to 500 mV.

8. The electronic circuit of claim 7 wherein said supply voltage is about 3 V, said upper voltage is about 350 mV and said lower voltage is about 250 mV.

9 A system comprising:

a meter for receiving an electrochemical cell configured for receiving a biological sample and having a capacitance created by said biological sample when a voltage is applied to said electrochemical cell;

a DC voltage supply configured to be electrically connectable to said electrochemical cell for charging the electrochemical cell, wherein in a cell capacitance is created; and

an electronic circuit integrally configured with said meter and configured to be electronically connectable to said electrochemical cell, said circuit comprising an oscillator circuit configured to receive a voltage input signal resulting from the charging and discharging of the electrochemical cell and configured to convert the voltage input signal to an oscillating voltage output signal, wherein the period of oscillating voltage output signal is proportional to the cell capacitance.

10 The system of claim 9 wherein said electronic circuit further comprises a microprocessor electrically connected to said oscillation circuit and configured to determine the volume of the biological sample.

11. A system for determining the volume of a biological sample within an electrochemical cell having a surface area and a volume, comprising:

a voltage supply configured for applying a first voltage to said electrochemical cell;

means for measuring a second voltage generated by said cell when said first voltage is applied to said cell;

means for converting said second voltage into a oscillating voltage;

means for deriving the capacitance of said cell from said oscillating voltage;

means for deriving the surface area of said cell covered by said biological sample from said cell capacitance; and

means for deriving the volume of said biological sample from said surface area.

12. The system of claim 11 further comprising means for determining whether said sample volume is adequate for making an accurate measurement of the concentration of one or more selected analytes within said biological sample.

13. The system of claim 12 further comprising:

means for measuring the concentration of one or more selected analytes within said biological sample; and

means for compensating for said sample volume determined to be inadequate while measuring the concentration of one or more selected analytes within said biological sample.

14. The system of claim 13 further comprising means for displaying the measured concentration of one or more selected analytes within said biological sample.

15. A method for determining the volume of a biological sample applied to an electrochemical biosensor, comprising:

applying a direct current voltage to the biosensor thereby charging the biosensor, wherein a capacitance is created within the biosensor and a voltage is generated by charging the biosensor;

converting the voltage to an oscillating voltage having a period proportional to the capacitance;

determining the capacitance of the biosensor;

determining the surface area of the portion of the biosensor in contact with the biological sample based on said determined capacitance; and

determining the volume of the sample from said determined surface area.

16. The method of claim 15 further comprising determining whether said sample volume is adequate for measuring one or more selected characteristics of said sample.

17. The method of claim 16 further comprising:

determining the necessary compensation factor to compensate for the inadequate volume based on a determination that said sample volume is inadequate;

compensating for the inadequate sample volume; and

measuring at least one characteristic of said sample;

18. The method of claim 17 wherein the characteristic of said sample is the concentration of one or more analytes present within said sample.

19. The method of claim 18 wherein determining the necessary compensation factor comprises determining the ratio of the capacitance of the biosensor when completely filled with said sample to the capacitance of the biosensor filled with said inadequate sample volume.

20. The method of claim 15 further comprising determining said surface area of the portion of said biosensor in contact with said biological sample based on said determined capacitance.

21. The method of claim 15 wherein said electrochemical biosensor comprises at least two electrodes forming an electrochemical cell having a cell volume and wherein said determined surface area is a surface area of said at least two electrodes covered by said biological sample.

22. The method of claim 15 wherein said average direct current voltage is in the range from about 0 to 600 mV.

23. A method for determining the volume of a biological sample applied to an electrochemical biosensor, comprising:

providing the system of claim 9;

applying a DC voltage to said biosensor thereby charging the biosensor, wherein a capacitance is created within the biosensor, and generating a charged voltage as a result the capacitance; and

converting the charged voltage to an oscillating voltage having a frequency proportional to the capacitance.

24. The method of claim 23 further comprising:

providing the system of claim 10;

determining the capacitance of the biosensor from said oscillating voltage by means of said microprocessor.

25. A kit for determining the volume of a biological sample deposited into an electrochemical test strip, said kit comprising at least one electronic circuit according to claim 1.

26. The kit of claim 25 further comprising an automated device within which said electronic circuit is integrally configured.

27. The kit of claim 26 further comprising instructions for using said electronic circuit and said automated device.

28. A kit for determining the volume of a biological sample within an electrochemical cell, comprising:

a system according to claim 9; and

instructions for using said system.

29. The kit of claim 28 further including an automated device integral with said system configured to operatively receive and engage said electrochemical cell for determining one or more physical or chemical characteristics of the biological sample.